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The 1961 FIRE SEASON in the PACIFIC NORTHWEST

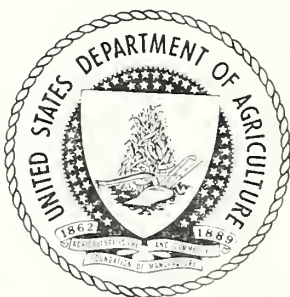
by OWEN P. CRAMER



PACIFIC NORTHWEST
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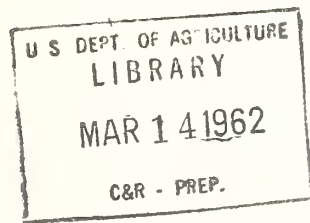


BOOK NUMBER

THE 1961 FIRE SEASON
IN THE PACIFIC NORTHWEST

by

Owen P. Cramer



December 1961

PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION
R. W. Cowlin, Director Portland, Oregon

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE

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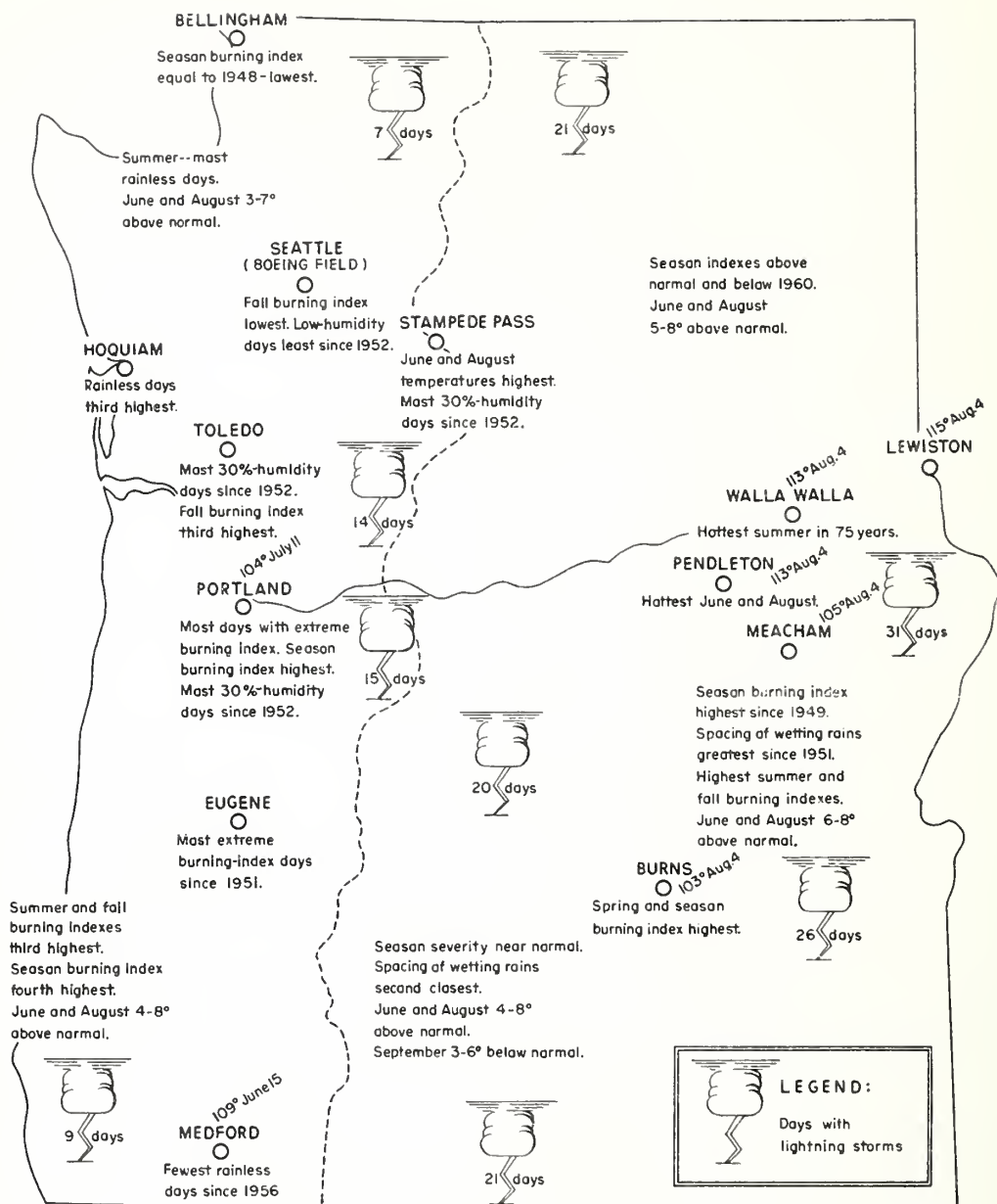


Figure 1. -- 1961 fire-weather highlights.

SUMMARY

The 1961 fire season was more severe than normal in east-central Washington and northeast Oregon, slightly less severe than normal in south-central Oregon, and near normal in western portions of Oregon and Washington. The season was slightly less severe than 1960, except in northeast Oregon where the 2 years were equally bad, and in western Washington where this year was worse than last. Notable were the record number of rainless days during the summer in western Washington, the large number of days with thunderstorms over the national forests east of the Cascades, and uncommonly hot temperatures through June and August (fig. 1).

The 1961 season started early west of the Cascades with a prolonged period in January of dry and comparatively warm east winds. The fire season proper began in April and May with typical temperature and rainfall throughout the region, but changed abruptly in June to extraordinary high temperature and below-average rainfall. Spring fire-weather severity varied from below average in western Washington to near average around the rest of the region. Summer, with higher than usual temperature in July, an exceedingly hot August, and typical insignificant amounts of rainfall, was generally more severe than usual, particularly in northeast Oregon. Summer fire weather was below average in severity in south-central Oregon. Fall slash burning conditions were generally quite favorable, with alternating periods of rain and dry weather in September and October. Though October was generally cool with the usual rainfall, fall fire weather was more severe than normal, except in south-central Oregon and western Washington where conditions were near average.

Fire Occurrence

From January through October 1961, there were considerably more fires in forest areas throughout Oregon and Washington than in all of 1960. Lightning was the big contributor with east and west sides of both States reporting more lightning fires than in 1960. Regional totals were 3,064 lightning fires in 1961 compared to 1,628 in 1960. The national forests of both States reported more lightning fires than in any year since records were initiated in 1908. Man-caused fires were up, too, increasing sharply over 1960 in western Washington

and slightly in Oregon, while there were substantially fewer man-caused fires in eastern Washington. Regional totals were 2,587 man-caused fires in 1961 compared with 2,247 in 1960. However, total acreage burned was less--101,457 acres compared with 118,857 in 1960. In the rangelands of southeastern Oregon, Bureau of Land Management crews were busy with some 290 fires that burned approximately 150,000 acres of rangeland--both numbers higher than in 1960.

Computed Occurrence

In both States, man-caused fires were more numerous on forest lands west of the Cascades than would have been expected with similar fire weather during 13- and 17-year base periods ending in 1956. On the other side of the ledger, a greater than expected proportion of all fires were extinguished before burning more than a quarter acre, and a smaller than expected proportion reached a large size.

INTRODUCTION

Fire-Weather Indexes

Severity of weather conditions during the 1961 forest fire season is compared with that in previous years by the use of three indexes of weather conditions that are closely related to the ease with which fires start, the speed with which they spread, and the depth to which they burn. These weather indexes are: (1) total number of days when no rain fell, (2) average number of days since a wetting rain of one-fourth inch or more, and (3) burning index, a rating of the combined effect of fuel moisture and windspeed on rate of fire spread. High burning index means high rate of spread. General severity of the season is judged by considering all three indexes.

Each index is an average of separate measurements from widely distributed Weather Bureau and Federal Aviation Agency stations and one Air Force station.^{1/} These valley and mountain stations

^{1/} Although all days in the April-through-October fire season were used in the calculation of rainless days and number of days since a wetting rain, the burning index rating is based on only the half of the days with highest burning index, according to the Forest Service scale used in the Pacific Northwest Region. Fuel moisture is estimated from records of relative humidity.

provide an unbroken record for the 7-month season both for the current year and many previous years, thus permitting valid comparisons of the present with the past.

Computed 1961 Fire Occurrence

The principal reason for rating the severity of fire-season weather is to establish a basis for comparing fire occurrence between years. We recognize that fewer fires will occur during a damp season and that their average size is likely to be smaller than during a dry and windy season. An intensive fire-prevention campaign may also result in fewer fires, and faster and stronger initial attack may result in smaller fires. It is impossible to identify the effects of prevention and suppression, however, without knowledge of the effect of weather on fire occurrence. In a separate study,^{2/} high correlations were found between the season weather indexes and three measures of fire occurrence, permitting regression equations to be developed. These equations define the relations between fire occurrence and weather during 13- and 17-year base periods ending with 1956. Since the fire occurrence computed with these equations represents what would have been expected during the base period, differences between the computed and observed occurrence indicate changes in patterns of fire occurrence since the base period. The fire occurrence that would have been expected in western Oregon and western Washington under the 1961 weather conditions has been computed from these equations.

Three indexes of fire occurrence have been used, each to indicate different conditions likely to be of importance to fire control agencies. These indexes are (1) the total number of man-caused fires, (2) the percentage of all fires that do not exceed one-fourth acre, and (3) the percentage of all fires that reach 10 acres and larger on State and privately protected lands and 100 acres and larger on national forest protected lands. The first may be useful in evaluating changes in man-caused risk or in the effectiveness of prevention efforts. Changes in the second index may indicate change in

^{2/} Cramer, Owen P. Relation of number and size of fires to fire-season weather indexes in western Washington and western Oregon. U.S. Forest Serv. Pac. NW. Forest and Range Expt. Sta. Res. Note 175, 11 pp., illus. 1959. (Processed.)

effectiveness of initial attack. Adequacy of followup on larger fires may be reflected in the third index.

The 1961 Detailed Summary

Several changes have been made in the format of the 1961 analysis of fire-season severity. Both eastern and western portions of Oregon and Washington are included in a single report. The analysis for east-side areas has been expanded to include season burning index. A separate discussion of all aspects of the fire season is presented for each of five geographical sections of the region. Tables of weather indexes have been prepared for each of the five sections of the region, and these have been placed together following the narrative. Tables of supplementary information are also included:

1. Number of days with 4 p.m. relative humidity 30 percent or lower in western Oregon and western Washington (table 2).
2. Number of days with 4 p.m. burning index greater than 28 on the west side and greater than 51 east of the Cascades (tables 3 and 9).
3. Number of days on which lightning storms were reported over the national forests (table 4).
4. Forest fire occurrence in Oregon and Washington in 1960 and 1961 (table 5).
5. Computed and actual fire occurrence in western Oregon and western Washington (table 6).

WESTERN OREGON

Fire-Season Indexes and Weather

Temperatures 6° to 8° above normal in June, 1° to 3° above normal in July, and 4° to 6° above normal in August dominated the western Oregon fire season. This midseason heat is reflected in the fourth highest burning index of the 30-year record, only slightly lower than 1960 which had the highest burning index since the record 1951 season (table 1). Excessive temperature and high burning index overshadowed the near-normal number of rainless days and the below-normal spacing of wetting rains. The departure from normal was

greatest in the northern half where days with humidity 30 percent or less were a bit more numerous than in 1960 (table 2). Extremely high burning-index days were the most frequent since 1951 at Eugene and the most frequent of record at Portland (table 3). Burning index and time between wetting rains were lowest in a number of years at Medford. Lightning storms were more frequent than in 1959 and 1960, but were generally fewer than in 1956 (table 4).

Spring. -- Except for the first week of April, rain dominated the spring portion of the fire season through June 11 resulting in the lowest average time between wetting rains since 1953, while both burning index and total rainless days were normal. April and May temperatures were normal.

Summer. -- Summer wetting rains were confined to July 4-5 in northwestern Oregon, August 31-September 1 in northwestern and coastal portions, and September 15-16 in central and southern portions. While both rainfall indexes were near normal, extreme temperature was reflected in the third highest burning index of the 30-year record; only 1959 and 1960 were higher. The greatest concentration of high burning-index days occurred from the 6th to the 13th of September.

Fall. -- Wetting rains in late summer and again during October 6-11 and 21-28 cut the average time between wetting rains to well below normal with a near-average number of rainless days. Drying between rains was pronounced, however, resulting in the third highest fall burning index of record, exceeded only in 1936 and 1958. Burning indexes were well up between September 19 and October 5.

Fire Occurrence

Fire occurrence was up from 1960 (table 5) despite the slightly lower severity indicated by the indexes. The 653 lightning fires were almost double the 1960 figure of 362. The national forests reported 422 of these. Man-caused fires increased from 677 to 709, with all of the increase occurring on State and privately protected lands which had the greatest number since 1952. Acreage burned increased only moderately on national forest lands, from 761 to 975 acres, despite the greatest number of fires from all causes since 1941. Acreage increased on State and privately protected land from 8,905 to 12,088 acres, with the greatest number of fires since 1949.

Computed Fire Occurrence

In comparison with the fire occurrence that might have been expected in the 1940-56 period under similar weather indexes, the number of man-caused fires on national forest lands was 152 percent of the estimated number, and on State and privately protected land, 132 percent (table 6). This represents a slight increase from 1960 on both. On both protection areas, a larger than expected proportion of all fires were held to less than a quarter acre. An even greater proportion of fires was held within the smallest size class in 1960. Furthermore, the proportion of all fires becoming large was considerably below that expected for the base period in both protection areas, though above 1960 proportions.

WESTERN WASHINGTON

Fire-Season Indexes and Weather

Near-normal fire-season weather prevailed in western Washington except that total number of rainless days was above normal, exceeding 1959 and 1960 (table 7). Burning index and average time since a wetting rain were similar to 1960 and near normal. Temperatures averaged 3° to 7° above normal in June, 2° to 3° above normal in July, and 3° to 6° above normal in August. Rainfall was below normal in June and July, normal in August, and below normal in some areas in September and October. Burning index equaled 1948 at Bellingham, the lowest of record. At the other end of the scale, Hoquiam had the third highest number of rainless days of the 26-year record. Humidities 30 percent and lower were the most frequent since 1952 at Toledo, while Boeing Field had the least number since 1955 (table 2). In the higher elevations, Stampede Pass reported the greatest number of low-humidity days since 1952. Days with extreme burning index were more frequent than in 1960 except at Boeing Field (table 3). Lightning storms were as frequent over the national forests as in 1960 (table 4).

Spring. --Spring was dominated by rain through May 14, and rains occurred again late in May and June 6-10. The average number of days since wetting rain and total rainless days were about average, though burning index was below average and the lowest since 1957.

Summer. --Summer rains were few, with total rainless days the highest of record, but their spacing and intensity held the average time since a wetting rain to slightly below average. Between the

rains of July 5-6 and August 30-September 1, burning index was higher than normal and equal to 1960. Highest burning index of the season occurred on September 12-13 with a severe east wind.

Fall. -- Fall rains on September 28-29, October 5-12, and October 23-28 reduced total rainless days to normal, while spacing of wetting rains was greater than average--in fact the highest since 1957. Though the western Washington fall burning index was normal, it varied from the lowest of the 26-year record at Boeing Field to third highest of record at Toledo. September and October temperatures averaged 2° to 4° below normal.

Fire Occurrence

Fire occurrence was considerably higher than in 1960 with 1,362 fires compared to 743 (table 5). Man-caused fires increased from 689 to 1,080 while lightning fires increased from 54 to 282. Greatest increase in man-caused fires was 584 to 948 on State and privately protected land. Acreage burned dropped to 910 acres on the national forests but rose to 1,865 acres on State and private lands.

Comparison With Computed Fire Occurrence

In comparison with the fire occurrence that might have been expected in the 1944-56 period under similar weather indexes, man-caused fires on the national forests were 213 percent of the expected number compared with 273 percent of expected in 1960 (table 6). The 132 man-caused fires, the greatest number on western Washington's national forests in the past 18 years, continued a trend that has resulted in an average increase of five fires per year. Although the total number of fires from all causes on Washington national forests was second greatest to 1958, the proportion of these held to one-quarter acre or less was as expected, while the proportion becoming large was only half that expected.

On State and privately protected lands, the number of man-caused fires was 135 percent of the number expected with similar weather in the base period. This is the first time since 1956 that the actual number of man-caused fires has been greater than the expected on these lands. Although State and private crews had the greatest number of fires to fight since 1952, a larger than expected proportion was held to a quarter acre or less. This continues what appears to be a gradual trend toward a greater proportion of all fires remaining in the smallest size class. Despite the fact that more fires exceeded

10 acres than in any year since 1956, the percent of all fires that became large was approximately a third of the expected proportion.

EAST-CENTRAL WASHINGTON

Fire-Season Indexes and Weather

In this area of little rain, the fire season averaged above-normal severity in all three indexes but was less severe than the 1960 season in each index (table 8). Rainfall was normal or above in April and May, while temperature averaged normal. The next 3 months were hot with temperatures 5° to 6° above normal in June, 2° to 4° above normal in July, and 5° to 8° above normal in August. Below-normal rainfall in June was followed by normal light amounts during July, August, and September. Summer lightning storms over national forests were considerably more numerous than in 1960 (table 4). October rainfall was below normal. September and October temperatures were several degrees below normal.

Spring. --In terms of burning index, the fire season got off to a vigorous start in April with more extreme burning-index days than any other month (table 9). Three more extreme burning-index days in June, plus generally high burning index in the spring portion, resulted in a spring burning index substantially higher than summer, a relation that also existed in 1960. Although the rainy period, April 29 to May 10, reduced average time since a wetting rain to the lowest since 1957, total rainless days was about normal.

Summer. --Summer burning index was lower than 1960 but was still high. Spacing of wetting rains was below average due primarily to the wetting rain at Omak on July 23; total rainless days was normal. Many new high-temperature records were set on August 4, including 108° at both Yakima and Spokane.

Fall. --Fall burning index also was high, though below 1960. Both rainfall indexes were well above average and similar to 1960. When a wetting rain finally occurred at Yakima on October 27, it was the first wetting rain in 170 days.

Fire Occurrence

Effect of the decrease in season severity from 1960 was noted in a decrease in number of man-caused fires from 394 to 307 (table 5). Number of lightning fires, however, jumped from 70 to 638 as number

of days with lightning storms over the national forests increased from 11 to 18. Acreage burned increased from 11,312 acres in 1960 to 14,008 acres.

NORTHEASTERN OREGON

Fire-Season Indexes and Weather

Fire-season severity was generally high and similar to 1960. Burning index averaged higher than in 1960 and was the highest since 1949 which it nearly equaled (table 10). The number of days since a wetting rain was the same as in 1960, and total rainless days was near normal and less than 1960. There were scattered, mostly light, rains through June 11; light rains July 5, August 5 and 15; and more general rains on October 27-28. Temperatures soared 6° to 8° above normal for the months of June and August, averaging 2° above normal in July. Lightning storm occurrence was near record levels, only slightly less than in 1960 (table 4). In August alone, several forests were subjected to more than 18 days with lightning storms. Extreme burning indexes were slightly more numerous than in 1960 in most portions (table 9).

Spring. -- Despite near-normal temperature in April and May, spring burning index was high and approximately equal to 1960. Spring burning index at Burns was the highest of record. Average number of days since a wetting rain and total rainless days were both well below 1960 as precipitation was near normal in April and May and a third of normal in June. June was the hottest of record and third driest of record at Pendleton.

Summer. -- The summer portion was slightly more severe than in 1960 with the highest burning index of record. Spacing of wetting rains was well above average, though slightly below 1960. Rainless days were barely more numerous than both the normal and the 1960 figure. August 4 was the hottest day of a hot month, setting records of 113° at Pendleton and Walla Walla, 105° at Meacham, and 115° at nearby Lewiston, Idaho. Light rains occurred July 5 and August 5 and 15.

Fall.--Fall burning index was the highest of record, with individual station records set at Pendleton and Meacham. Spacing of wetting rains was far above both the 1960 figure and the 10-year average. Although wetting rains occurred elsewhere on October 28, after 174 days Pendleton was still awaiting a wetting rain on October 31. A few light rains did occur, resulting in number of rainless days similar to 1960 and to normal.

Fire Occurrence

Lightning fires in northeastern Oregon national forests and State and privately protected lands exceeded the 1960 total--1,051 to 939 (table 5). Man-caused fires averaged a few more than in 1960, though there were more on State and private lands and a few less on national forests than in 1960. Burned acreage was substantial, though less than 1960--68,644 acres compared with 88,168 in 1960.

SOUTH-CENTRAL OREGON

Fire-Season Indexes and Weather

Near-average fire-season severity was indicated by the indexes which showed that the 1960 season was more severe (table 11). The 1961 pattern gave a burning index below 1960 but still substantial, average number of days since wetting rain second lowest of the 14-year record, and total rainless days near average. Except for slightly below-normal rainfall in April and June, precipitation was about normal throughout the season. Temperature varied from 1° to 2° below normal in April and May to 6° to 8° above normal in June. July and August were also hotter than normal, while September was 3° to 6° cooler than normal. Thunderstorm occurrence neared record levels over the national forests (table 4). Extreme burning indexes were much fewer than 1960 at Lakeview and similar to 1960 at Redmond and Klamath Falls.

Spring. --Spring rainfall indexes were normal while burning index was high. More days with extreme burning index occurred in May than any other month with June running a close second, primarily at Lakeview (table 9). Except for less time between wetting rains than in spring 1960, the indexes in the two springs were nearly identical.

Summer. --Summer continued warm with July 2° to 3° above normal and August 4° to 6° above normal. Wetting rains occurred in most areas in mid-August, resulting in comparatively short intervals while other indexes were near normal. All indexes were below 1960.

Fall. --Fall was cool with normal rainfall. Fall indexes were all below 1960, though only the spacing of wetting rains was below average.

Fire Occurrence

In south-central Oregon more fires burned less acreage than in 1960 on both national forests and State and privately protected lands (table 5). Lightning fires increased from 203 to 440. Man-caused fires dipped slightly, from 233 to 224, though an increase from 37 to 58 was noted on State and privately protected lands. The 664 fires burned 2,967 acres in comparison with 6,729 acres burned by 436 fires in 1960.

Table 1.--1961 fire-weather indexes and comparative data
for western Oregon^{1/}

Item	:	:	:	:	Record ^{2/}	
	: Cur-	: Pre-	:	:		
	: rent	: vious:	10-year	:		
	: year	: year	: average	:	Low	High
	:(1961):	(1960):	(1951-60):			
	:	:	:	:	:	:
Spring (April 1-June 30):						
Burning index	24.8	26.2	24.7	15.9 (1953)	33.7 (1951)	
Average days since wetting rain	7.8	9.1	12.5	5.5 (1933)	22.9 (1935)	
Total rainless days	57.2	53.2	58.6	46.2 (1948)	75.8 (1924)	
Summer (July 1-Sept. 15):						
Burning index	38.1	40.5	33.5	25.3 (1954)	40.5 (1960)	
Average days since wetting rain	39.6	61.5	41.2	15.9 (1947)	75.5 (1935)	
Total rainless days	67.2	67.2	68.3	59.3 (1954, 1947)	74.8 (1929)	
Fall (Sept. 16-Oct. 31):						
Burning index	23.2	22.2	19.0	10.0 (1940)	26.4 (1936)	
Average days since wetting rain	10.3	55.9	24.3	5.3 (1955)	94.4 (1932)	
Total rainless days	30.8	34.5	32.3	22.2 (1950)	42.5 (1936)	
Season (April 1-Oct. 31):						
Burning index	29.2	30.5	26.6	18.5 (1953)	31.3 (1951)	
Average days since wetting rain	19.8	38.0	25.4	13.5 (1941)	48.8 (1932)	
Total rainless days	155.2	154.9	159.0	139.5 (1948)	176.0 (1952)	

^{1/}Indexes based on observations at the following Weather Bureau or Federal Aviation Agency stations: Burning index--Portland (International Airport), Eugene, Sexton Summit, and Medford. Rainfall indexes--Portland, Eugene, North Bend, and Medford.

^{2/}Burning index computed 1932-61 except for 1933, 1934, 1937, and 1939. Average days since wetting rain and total number of rainless days computed 1922-61, except for 1923 and 1927.

Table 2.--Number of days between April 1 and October 31
with relative humidity 30 percent or lower in
western Oregon and western Washington^{1/}

Section and station	:	:	:	Record ^{2/}	
				:	
	1961	1960		Low	High
Western Oregon:					
Portland	22	20	8 (1941, 1948)	37	(1938)
Eugene	48	43	12 (1941)	65	(1951)
Sexton Summit	42	46	4 (1955)	58	(1959)
Medford	103	122	46 (1948)	135	(1951)
 Western Washington:					
Toledo	14	13	1 (1948)	26	(1951)
Stampede Pass	14	11	1 (1948)	20	(1951)
Seattle (Boeing Field)	8	15	2 (1948)	42	(1958)
Bellingham	0	3	0 (1945, 1948, 1952, 1953)	6	(1946)

^{1/} Relative humidity observed at 4:30 p.m. until June 1, 1957;
at 4 p.m. thereafter.

^{2/} Same period of record as burning index (footnote 2, tables 1
and 7).

Table 3.--Number of days between April 1 and October 31
with burning index greater than 28 in western
Oregon and western Washington^{1/}

Section and station	:	:	:	Record ^{2/}	
				Low	High
	:	:	:		
	:	:	:		
Western Oregon:					
Portland	<u>3/</u> 28	20	7 (1935, 1953)	27 (1944, 1945)	
Eugene	60	52	14 (1942)	76 (1951)	
Sexton Summit	35	58	8 (1947)	47 (1936)	
Medford	47	52	17 (1953)	97 (1957)	
Western Washington:					
Toledo	5	1	0 (1955)	12 (1951)	
Stampede Pass	23	20	4 (1955)	34 (1951)	
Seattle (Boeing Field)	6	16	4 (1953)	44 (1951)	
Bellingham	2	0	0 (1945, 1948)	7 (1951)	

^{1/} Burning index observed at 4:30 p.m. until June 1, 1957; at 4 p.m. thereafter.

^{2/} Same period of record as in tables 1 and 7 (footnote 2).

^{3/} New record high.

Table 4.--Number of days with lightning storms over Oregon and Washington national forests between July 1 and September 15 in 1961 compared with previous years^{1/}

Section and national forest	Cur- rent year (1961)	Pre- vious year (1960)	10-year average (1951-60)	Record	
				Low	High
Western Washington:					
Olympic	4.0	5.0	3.4	0 (1954)	8.0 (1956)
Mt. Baker	7.0	7.0	6.5	2.0 (1951, 1954)	11.0 (1953, 1958)
Snoqualmie	14.0	13.0	9.5	5.0 (1954, 1959)	19.0 (1956)
Gifford Pinchot	11.0	10.0	7.2	2.0 (1951)	13.0 (1956)
Section average	9.0	8.8	6.6	2.5 (1954)	11.0 (1956)
Western Oregon:					
Siuslaw	10.0	4.0	2.4	0 (1950, 1957)	8.0 (1956)
Mt. Hood	15.0	12.0	8.9	2.0 (1950, 1951, 1954)	21.0 (1956)
Willamette	15.0	8.0	5.9	1.0 (1954, 1955)	16.0 (1956)
Umpqua	10.0	11.0	8.0	1.0 (1950)	18.0 (1958)
Rogue River	9.0	9.0	11.9	2.0 (1955)	25.0 (1958)
Siskiyou	9.0	4.0	4.7	0 (1954)	13.0 (1956)
Section average	11.3	8.0	7.0	1.5 (1954)	15.8 (1956)
East-central Washington:					
Okanogan	21.0	13.0	14.3	2.0 (1959)	28.0 (1956)
Wenatchee	16.0	9.0	8.4	2.0 (1959)	23.0 (1956)
Section average	18.5	11.0	11.4	2.0 (1959)	25.5 (1956)
Northeastern Oregon:					
Umatilla	26.0	27.0	16.1	4.0 (1959)	27.0 (1960)
Wallowa-Whitman	31.0	35.0	22.3	9.0 (1959)	35.0 (1960)
Ochoco	20.0	26.0	14.2	6.0 (1959)	26.0 (1960)
Malheur	26.0	27.0	18.8	12.0 (1950, 1951, 1959)	33.0 (1956)
Section average	25.8	28.8	17.8	7.8 (1959)	28.8 (1960)
South-central Oregon:^{2/}					
Deschutes	^{3/} 19.0	13.0	11.1	7.0 (1955, 1958)	19.0 (1952)
Fremont	21.0	13.0	15.3	5.0 (1954)	27.0 (1956)
Winema ^{4/}	13.0	--	--	--	--
Section average	17.7	--	--	--	--

^{1/} Based on daily reports to U.S. Weather Bureau and on ranger district field records (R6-5120-49). Period of record 1950-1961.

^{2/} 1957 data not available.

^{3/} Equals existing record.

^{4/} First fire season for this new national forest.

Table 5.--Fire occurrence in Oregon and Washington on Forest Service
and on State and privately protected lands, 1960 and 1961^{1/}

Area and protection agency	1961				1960			
	Light- ning fires	Man- caused fires	Total fires	Acreage burned	Light- ning fires	Man- caused fires	Total fires	Acreage burned
	----- Number -----				----- Number -----			
Western Washington:								
Forest Service	180	132	312	910	34	105	139	2,182
State and private	102	948	1,050	1,865	20	584	604	800
Total	282	1,080	1,362	2,775	54	689	743	2,982
Eastern Washington:								
Forest Service ^{2/}	329	91	420	6,350	34	143	177	1,331
State and private	309	216	525	7,658	36	251	287	9,981
Total	638	307	945	14,008	70	394	464	11,312
Washington total	920	1,387	2,307	16,783	124	1,083	1,207	14,294
Western Oregon:								
Forest Service	422	177	599	975	176	203	378	761
State and private	231	532	763	12,088	186	474	660	8,905
Total	653	709	1,362	13,063	362	677	1,038	9,666
Northeastern Oregon:								
Forest Service ^{3/}	800	155	955	12,025	745	177	922	68,722
State and private	251	122	373	56,619	194	77	271	19,446
Total	1,051	277	1,328	68,644	939	254	1,193	88,168
South-central Oregon: ^{4/}								
Forest Service	375	166	541	2,684	166	196	362	6,220
State and private	65	58	123	283	37	37	74	509
Total	440	224	664	2,967	203	233	436	6,729
Oregon total	2,144	1,200	3,354	84,674	1,504	1,164	2,667	104,563
Region total	3,064	2,587	5,661	101,457	1,628	2,247	3,874	118,857

^{1/} Figures derived from agency reports to October 31, 1961.

^{2/} Exclusive of Washington portion of the Umatilla National Forest and the Colville National Forest.

^{3/} Includes Washington portion of the Umatilla National Forest.

^{4/} Area occupied by Winema National Forest in 1961 included with State and privately protected land in 1960.

Table 6.--Computed and actual fire occurrence in 1961:

western Oregon and western Washington^{1/}

Measure of occurrence and area	1961 occurrence		Actual occurrence as percentage of computed		
	Com- puted	Actual to 10/31	1961	1960	10-year average (1951-60)
----- Percent -----					
Man-caused fires (number):					
State and private:					
Western Oregon	404	532	131.6	121.2	93.5
Western Washington	700	948	135.4	85.9	100.6
National forest:					
Western Oregon	117	177	151.8	123.0	107.4
Western Washington	62	132	212.9	273.0	171.2
Fires 1/4 acre and less (percentage of all fires):					
State and private:					
Western Oregon	55.8	64.7	116.0	^{2/} 139.3	105.2
Western Washington	57.9	73.1	126.3	113.4	112.2
National forest:					
Western Oregon	70.8	82.0	115.7	^{2/} 120.9	103.1
Western Washington	82.0	80.8	98.5	89.1	100.7
Fires 10 acres and larger (percentage of all fires):					
State and private:					
Western Oregon	11.7	7.9	67.7	56.5	88.9
Western Washington	6.8	2.5	37.4	79.3	70.6
Fires 100 acres and larger (percentage of all fires):					
National forest:					
Western Oregon	2.0	.3	16.3	12.3	^{3/} 72.9
Western Washington	1.3	.6	50.4	53.8	^{4/} 70.8

^{1/}Computed fire occurrence is derived from equations expressing the relation between season fire-weather indexes and occurrence, 1940-56 in western Oregon and 1944-56 in western Washington.

^{2/}Highest of record.

^{3/}Average for 8 years. Computed occurrence was zero in 1953, and actual occurrence was zero in 1954.

^{4/}For only the 5 years in which fires 100 acres and larger occurred. None occurred 1953-57.

Table 7.--1961 fire-weather indexes and comparative data
for western Washington^{1/}

Item	: Cur- : rent : year : (1961):	: Pre- : vious: : year : (1960):	: 10-year : average : (1951-60):	Record ^{2/}	
				Low	High
Spring (April 1-June 30):					
Burning index	13.8	14.3	16.5	11.6 (1953)	24.3 (1951)
Average days since wetting rain	7.7	4.5	8.5	4.0 (1942)	15.7 (1938)
Total rainless days	53.3	41.3	52.0	41.3 (1960)	69.7 (1938)
Summer (July 1-Sept. 15):					
Burning index	20.0	20.5	18.3	10.0 (1954)	24.8 (1945)
Average days since wetting rain	20.1	24.8	22.7	8.3 (1943)	60.5 (1951)
Total rainless days	^{3/} 68.0	62.0	61.0	49.3 (1948)	67.5 (1951)
Fall (Sept. 16-Oct. 31):					
Burning index	9.6	8.3	9.7	5.1 (1955)	15.6 (1952)
Average days since wetting rain	9.9	4.5	7.6	2.7 (1956)	28.3 (1942)
Total rainless days	25.3	25.3	25.1	15.7 (1956)	38.0 (1936)
Season (April 1-Oct. 31):					
Burning index	15.1	15.2	15.7	11.8 (1955)	21.4 (1951)
Average days since wetting rain	12.6	11.8	13.4	7.0 (1948)	28.9 (1951)
Total rainless days	146.6	128.6	138.1	122.7 (1941)	162.3 (1938)

^{1/} Indexes based on observations at the following Weather Bureau or Federal Aviation Agency stations: Burning index--Toledo, Seattle (Boeing Field), Bellingham, and Stampede Pass. Rainfall indexes--Toledo, Hoquiam, and Bellingham.

^{2/} Burning index computed 1944-1961. Average time since wetting rain and total number of rainless days computed 1936-1961.

^{3/} New record high.

Table 8.--1961 fire-weather indexes and comparative data
for east-central Washington^{1/}

Item	:	:	:	:	Record ^{2/}	
	:	Cur-	Pre-	:		
	:	rent	vious:	10-year		
	:	year	year	average		
	:	(1961):	(1960):	(1951-60):	Low	High
	:	:	:	:		
Spring (April 1-June 30):						
Burning index		40.7	44.5	--	--	44.5 (1960)
Average days since wetting rain		16.3	18.5	23.7	6.9 (1948)	46.0 (1959)
Total rainless days		72.5	74.0	73.2	60.5 (1948)	85.0 (1949)
Summer (July 1-Sept. 15):						
Burning index		32.4	37.2	--	--	37.2 (1960)
Average days since wetting rain		59.7	84.0	65.5	21.0 (1948)	124.3 (1959)
Total rainless days		68.5	69.5	68.9	64.5 (1941, 1955)	74.5 (1945)
Fall (Sept. 16-Oct. 31):						
Burning index		27.4	30.3	--	--	30.3 (1960)
Average days since wetting rain		100.0	112.8	56.5	11.2 (1959)	127.7 (1945)
Total rainless days		41.5	41.0	37.0	23.0 (1947)	44.5 (1942, 1952)
Season (April 1-Oct. 31):						
Burning index		34.8	38.8	--	--	38.8 (1960)
Average days since wetting rain		49.9	62.3	45.5	14.7 (1948)	88.5 (1939)
Total rainless days		182.5	184.5	179.0	164.5 (1948)	197.0 (1949)

^{1/} Indexes based on observations at the following Weather Bureau stations: Yakima and Omak.

^{2/} Burning index computed for known bad years 1945, 1949, 1958-60. Average time since wetting rain and total number of rainless days computed 1939-61.

Table 9.--Number of days between April 1 and October 31
with burning index greater than 46: eastern
Oregon and eastern Washington^{1/}

Section and station	:	:	:	Record ^{2/}	
	:	:	:		
	1961	1960			
	:	:	:	Low	High
Central Washington:					
Omak	14	22	--	22	(1960)
Yakima	19	22	--	22	(1960)
Northeastern Oregon:					
Burns	14	11	--	15	(1951)
Redmond	6	4	--	28	(1949)
Pendleton	22	38	--	38	(1960)
Meacham	2	0	--	2	(1951)
South-central Oregon:					
Lakeview	10	35	--	35	(1960)
Klamath Falls	3	4	--	20	(1949)

^{1/} Burning index observed at 4:30 p.m. until June 1, 1957; at 4 p.m. thereafter.

^{2/} Burning index computed for only a few years known to have high fire danger: 1949, 1951, 1960 for northeastern and south-central Oregon, and 1945, 1949, and 1958-61 for east-central Washington.

Table 10.--1961 fire-weather indexes and comparative data
for northeastern Oregon^{1/}

Item	: : Cur- : rent : year : (1961):	: : Pre- : vious : year : (1960):	: : 10-year : average : (1951-60):	Record ^{2/}	
				Low	High
Spring (April 1-June 30):					
Burning index	33.5	34.1	--	--	37.9 (1949)
Average days since wetting rain	20.3	26.5	17.4	7.6 (1948)	26.8 (1949)
Total rainless days	66.7	72.0	69.7	49.0 (1948)	83.3 (1939)
Summer (July 1-Sept. 15):					
Burning index	^{3/} 41.3	37.8	--	--	40.3 (1949)
Average days since wetting rain	54.8	58.6	49.1	20.7 (1941)	79.6 (1951)
Total rainless days	71.0	70.0	69.7	57.0 (1941)	73.7 (1945)
Fall (Sept. 16-Oct. 31):					
Burning index	^{3/} 30.2	24.0	--	--	24.4 (1951)
Average days since wetting rain	72.5	45.9	49.9	16.8 (1940)	88.7 (1958)
Total rainless days	39.0	40.3	37.9	30.3 (1950)	45.6 (1952)
Season (April 1-Oct. 31):					
Burning index	35.6	33.3	--	--	35.8 (1949)
Average days since wetting rain	43.9	43.1	36.0	18.1 (1948)	53.6 (1949)
Total rainless days	176.7	182.3	177.4	153.6 (1948)	190.0 (1949)

^{1/} Burning index based on observations at the following Weather Bureau or Federal Aviation Agency stations: Pendleton, Meacham, Redmond, and Burns. Rainfall indexes based on observations at Pendleton, Redmond, and Burns.

^{2/} Burning index computed for known bad years: 1949, 1951, 1960. Average time since wetting rain and total number of rainless days computed 1939-61.

^{3/} New record high.

Table 11.--1961 fire-weather indexes and comparative data
for south-central Oregon^{1/}

Item	Cur-	Pre-	10-year	Record ^{2/}	
	rent	vious	average	Low	High
	: year	: year	: average		
	:(1961):	:(1960):	:(1951-60):		
	:	:	:	:	:
Spring (April 1-June 30):					
Burning index	37.2	37.5	--	--	38.8 (1949)
Average days since wetting rain	17.3	26.5	17.6	9.6 (1956)	26.5 (1960)
Total rainless days	71.3	71.3	71.2	63.3 (1953)	78.0 (1951)
Summer (July 1-Sept. 15):					
Burning index	33.4	38.4	--	--	40.2 (1949)
Average days since wetting rain	33.4	91.4	55.2	28.5 (1952)	91.4 (1960)
Total rainless days	70.3	72.7	71.2	64.3 (1958)	74.3 (1949, 1957)
Fall (Sept. 16-Oct. 31):					
Burning index	27.1	30.5	--	--	30.5 (1960)
Average days since wetting rain	33.5	79.7	46.9	26.6 (1957)	100.8 (1949)
Total rainless days	38.7	41.0	38.7	30.3 (1950)	44.7 (1952)
Season (April 1-Oct. 31):					
Burning index	33.6	36.3	--	--	37.2 (1949)
Average days since wetting rain	26.6	61.3	37.4	24.2 (1952)	61.3 (1960)
Total rainless days	180.3	185.0	181.1	174.0 (1956)	190.7 (1949)

^{1/} Indexes based on observations at the following weather stations: Redmond (Federal Aviation Agency), Klamath Falls (Air Force), and Lakeview (Weather Bureau).

^{2/} Burning index computed for known bad years: 1949, 1951, 1960.



